

VISIT...

LANZAROTE
Caliente.COM

Introduction to Neural Engineering: Neuroprosthetics & Brain-Computer Interfaces



SUMMARY

Lesson One: Entry Event—Launching the Neuroprosthetics Project

- 1.1. Introduction to Neuroprosthetics.
- 1.2. Introduction to Neural Engineering.

Lesson Two: Introduction to Systems

- 2.1. Systems Vocab
- 2.2. Vocab Guidance PowerPoint: Cell Phone Network

Lesson Three: Reaction Time Lab

- 3.1: What Can Impact Your Reaction Time? (Part I) Student Handout
- 3.2: What Can Impact Your Reaction Time? (Part II) Teacher Resource

Lesson Five: Action Potential

- 5.1. Action Potential Interactive Animation
- 5.2. Action Potential Race Analysis Chart

Lesson Seven: Neural Engineering & Brain-Computer Interfaces

- 7.1: Brain-Computer Interface Fact Sheets
- 7.2: Neural Engineering Examples

Lesson Eight: Introduction to Neuroethics

8.1. Socratic Seminar Structure & Rubric

8.2. Ethical Issues Surrounding

Lesson Ten: Pugh Charts & Peer Review

10.1. Pugh Chart Practice

10.2. Analyzing Solutions

Lesson Eleven (Optional): Online Research & Writing an Abstract

IRIANS

Lesson One: Introduction to Neuroprosthetics

LESSON OVERVIEW

Activity Time: Each lesson will be held in different dates.

60 minute/180 min class periods. With possibility of guest speaker.

60 min break will be taken according to the scheduled timing.

Lesson Plan Summary: In this lesson, students will be introduced to the Neuroprosthetics unit. They will learn the purpose and required outcomes of the neural engineering project through a memorable entry event.

Big Ideas & Understandings:

Students will understand that...

STUDENT UNDERSTANDINGS

- **Neural Prosthetics:** Neural prosthetics can be used to restore or enhance human function.
- **Neural Engineering:** Neural engineering is based on the loop between sensory information that is received by the brain, information that the central nervous system (CNS) sends out, and computers/machines that receive input and produce outputs that feedback into the CNS.

Essential Questions:

- How can science play a role in improving the lives of injured veterans returning from war?
- What is neural engineering and how can it be used to improve the lives of people?

Learning Objectives:

Students will know...

- What neural engineering is.
- What a neural prosthetic is.

Students will be able to...

- Articulate the main learning objectives of this seminar and how they will use them to develop their own neural engineering models.

Common Preconceptions & Misconceptions:

- Robotic systems and the human brain operate using two completely different systems.
- Every problem has one “perfect” solution that can be developed quickly.

Imagine...

...a world where infants who could not hear can finally hear their mother's voice.

...a world where veterans with amputated limbs could have more than just a steel pole for a prosthetic.

...a world where a person with quadriplegia who cannot use any of their limbs can learn to control robotic arms with their mind.

This “imaginary” world isn't just possible...it's becoming reality. And all of this is made possible by the field of neural engineering, which we will study during your next project.

So what is neural engineering?

Neural engineering is a field of engineering that focuses on integrating the nervous system, which controls how you move, feel, and interact with the world around you. The nervous system as you may know includes your brain, spinal cord, motor nerves to control your movement, and sensory nerves to gather information from the world around you. Without your nervous system, you would not be “you”: your personality, your intelligence, your desires all come from your nervous system.

Engineering is the key to repairing and utilizing the nervous system. Engineering is basically the practice of using math and science to solve real- world problems. The world as we know it is in disrepair, and more than ever we need engineers to help solve our world's problems.

For this course, you will become a Neural Engineer—you will use science, research, and even a bit of programming to model and improve the future.

